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Coral Reef Communities on Oil and Gas Platforms in the Gulf of Mexico: Where Nature and Industry Meet

Presentation to

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Introduction

Firstly, may I thank the honorable members of the House Sub-Committee on Energy and Natural Resources for allowing me to make this presentation today. I consider it a privilege and an honor.

The purpose of presentation is as follows: 1) to orient the Sub-Committee with respect to recent findings on the development of coral communities on offshore oil and gas platforms in the northern Gulf of Mexico; 2) to provide evidence for an increased environmental value of those platforms because of these developments; and, 3) to point out that these platforms may be suitable for the mariculture of corals and pharmaceutically valuable marine organisms.

The coral portion of this study was conducted with Amy Atchison (my graduate student in the Department of Oceanography and Coastal Studies at Louisiana State University) and Greg Boland of the Environmental Section of MMS in New Orleans. Remarks regarding mariculture stem from more recent collaborations with Steve Kolian (Eco-Rigs, Intl.) and Shirley Pomponi (Harbor Branch Oceanographic Institution). The coral portion of this study has been conducted under the auspices of MMS, and I am most grateful for their support, insight, and cooperation.

Development of Coral Communities on Oil and Gas Platforms in the Gulf of Mexico

Since the 1940s, ~40,000 wells have been drilled, and tens of thousands of platforms have been deployed. ~4,000 are currently in the northern Gulf of Mexico. This region has not possessed hard-substratum in shallow water, certainly not at its present sea level, for many thousands of years. In recent decades, the oil and gas platforms have provided this. Previously, deeper water soft bottom substratum extended for hundreds to thousands of kms.

The platforms have provided substratum for many marine organisms to settle on. These include a wide variety of Caribbean sponges, gorgonians, demersal fish, and the like. Preliminary observations suggested that platforms were being colonized by Caribbean corals as well. This observation was significant for several reasons. Firstly, corals are protected from take and harvest by federal law and are also prohibited from trade by international treaty. Secondly, the only major set of coral reefs in the northern Gulf of Mexico is the Flower Garden Banks (FGB), which occur 110 nm S-SE of Galveston, TX. These reefs have now been declared a NOAA National Marine Sanctuary. They are isolated from neighboring reefs by hundreds to thousands of kms. They formed on crests of two salt domes (diapirs), raised up through the crust of the earth. Oil and gas deposits are often associated with such structures, and, indeed, this was the case with the Flower Garden Banks. These reefs are now surrounded by oil and gas platforms.

In our study, we have surveyed 13 drilling platforms, covering a 40-60 km radius around the FGB. Thus far, we have found a total of 11 Caribbean coral species, eight of which were scleractinian (true), hermatypic (reef-building) corals. Most of the species we have found are characteristic of mature coral communities. *Madracis decactis* was the dominant coral. The second most abundant coral was the common brain coral, *Diploria strigosa*. Both of these species are indicative of the development of a mature coral community. Pioneer species – those characteristic of young, disturbed, or newly developed communities, such as *Agaricia* spp. or *Porites* spp., were rare or absent, which is unusual.

We found that coral abundance was strongly positively associated with platform age, in a highly predictable fashion. Coral species diversity exhibited the same relationship, increasing strongly with age of the platforms, indicating that the coral communities became more mature with age. This increases the environmental value of these platforms and may have implications for their decommissioning.

The presence of these new coral communities indicates an expansion of these populations through the northern Gulf of Mexico. Due to the limited sampling we performed in this pilot project, however, we do not know to what extent.

In addition, the mere presence of these corals indicates that mariculture of corals on offshore platforms is possible. The conditions are right for colonization and growth of corals there, and mariculture of these organisms would fill a market demand already present in the US while helping to decrease exploitation pressure both on our own reefs and those in other countries.

Development of Associated Reef Fauna

Along with corals, the platforms also possess a rich variety of associated fauna and flora. This includes sponges, hydroids, soft corals, and other organisms. Some of these groups are known to harbor novel complementary/secondary metabolites. These are compounds which are found usually only in that one species, often having a specific function for that species. In many cases, these compounds are toxic. In some cases, we have highly valuable therapeutic use for those compounds. Probably the most famous example of such a metabolite is penicillin, which was found a century ago in bread mold.

Some deep-water sponges produce complementary metabolites such as these. For example, one produces discodermolide, a toxin which is now known to have valuable anti-cancer properties. Unfortunately, this deep-water sponge is quite rare. In addition, the compound occurs in low concentrations and is difficult to synthesize. Thus, there is a high demand on the natural populations of this scarce natural resource. It would be possible to grow these sponges in mariculture on the platforms, while simultaneously alleviating exploitation pressure on the natural populations.

There are other organisms which occur on the platforms which have exhibit aggressive growth characteristics which suggest that they harbor novel, toxic, complementary/secondary metabolites. One of these is a didemnid ascidian.

Recommendations

In lieu of these new data which have come to light, I would recommend the following:

- . Extend coral surveys on platforms with respect to geographic range and depth to determine the full extent of coral colonization throughout the northern Gulf of Mexico.
- . Once this information is available, and a larger database is available for decision-making, consider the extent of coral colonization prior to decommissioning of older platforms, where such is appropriate.
- . Sample the platforms for potentially pharmaceutically valuable organisms.
- . Permit and support research and development regarding the use of platforms for mariculture of corals and pharmaceutically valuable marine organisms.

I thank you very much for your attention.

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